

CLAIMS

1 1. An electrode assembly for use in an ignition device, comprising:
2 an elongated center electrode having a lower axial end with a blind hole
3 extending into said lower axial end; and
4 a precious metal insert having a mechanical interlock feature and a sparking
5 surface;

6 wherein said mechanical interlock feature is located at least partially within
7 said blind hole with said lower axial end engaging said interlocked feature such that
8 an inner surface of said blind hole circumferentially contacts an outer surface of said
9 mechanical interlock feature, and wherein said center electrode is joined to said
10 precious metal insert by a peripheral weld with said weld including at least one
11 interruption that permits trapped gases to escape from said blind hole.

1 2. The electrode assembly of claim 1, wherein said mechanical interlock
2 feature is of a stepped design having upper and lower axial sections, such that the
3 radius of said mechanical interlock feature abruptly changes between said upper and
4 lower axial sections.

1 3. The electrode assembly of claim 2, wherein the radius of said mechanical
2 interlock at said upper axial section is greater than the radius of said mechanical
3 interlock at said lower axial section.

1 4. The electrode assembly of claim 1, wherein said mechanical interlock
2 feature is of a sloped design having upper and lower axial sections, such that the
3 radius of said mechanical interlock feature gradually changes between said upper and
4 lower axial sections.

1 5. The electrode assembly of claim 4, wherein the radius of said mechanical
2 interlock at said upper axial section is greater than the radius of said mechanical
3 interlock at said lower axial section.

1 6. The electrode assembly of claim 1, wherein a lower portion of said
2 precious metal insert includes an outer radius that is equal to an outer radius of said
3 lower axial end such that a smooth transition occurs between adjacent outer surfaces
4 of said electrode and said precious metal insert.

1 7. The electrode assembly of claim 6, wherein said weld circumferentially
2 extends around said assembly at said smooth transition.

1 8. The electrode assembly of claim 1, wherein said electrode includes a
2 copper core.

1 9. The electrode assembly of claim 1, wherein said precious metal insert is
2 made of platinum, iridium, a combination of platinum and iridium, or an alloy that
3 includes either platinum or iridium.

1 10. The electrode assembly of claim 1, wherein said weld includes three of
2 said interruptions, each spaced approximately 120° from the other interruptions.

1 11. An electrode assembly for use in an ignition device, comprising:
2 an elongated electrode having a lower axial end with a blind hole extending
3 into said lower axial end;
4 a precious metal insert having a mechanical interlock feature and a sparking surface;
5 and

6 a vent hole extending from an interior location of said blind hole to a location
7 exterior of said assembly;

8 wherein said mechanical interlock feature is at least partially located within
9 said blind hole, with said lower axial end engaging said interlock feature such that an
10 inner surface of said blind hole circumferentially contacts an outer surface of said
11 interlock feature, and wherein said electrode is welded to said precious metal insert at
12 an outer peripheral interface between said electrode and said precious metal insert.

1 12. The electrode assembly of claim 11, wherein said vent hole radially
2 extends through said lower axial end.

1 13. The electrode assembly of claim 11, wherein said vent hole axially
2 extends through said precious metal insert.

1 14. An ignition device for use in an internal combustion engine,
2 comprising:

3 a metallic shell having a central bore;

4 an insulator secured within said central bore and having an axial bore that is
5 generally coaxial with said central bore; and

6 a center wire assembly secured within said axial bore and at least comprising:

7 an elongated electrode having a lower axial end with a blind hole extending
8 into said lower axial end; and

9 a precious metal insert having a mechanical interlock feature and a sparking
10 surface;

11 wherein said mechanical interlock feature is at least partially located within
12 said blind hole with said lower axial end engaging said interlock feature such that an
13 inner surface of said blind hole circumferentially contacts an outer surface of said
14 interlock feature, and wherein said lower axial end is joined to said precious metal
15 insert by a peripheral weld with said weld including at least one interruption that
16 permits trapped gases to escape from said blind hole.

1 15. The ignition device of claim 14, wherein said ignition device
2 comprises a spark plug.

1 16. The ignition device of claim 14, wherein said ignition device
2 comprises an igniter.

1 17. A method of manufacturing an electrode assembly for use in an ignition
2 device, comprising the steps of:

3 (a) providing an elongated electrode having a lower axial end with a blind
4 hole extending into said lower axial end;

5 (b) providing a precious metal insert having a mechanical interlock feature
6 and a sparking surface;

7 (c) inserting said precious metal insert into said blind hole such that at
8 least a portion of said mechanical interlock feature is located within said blind hole;

9 (d) mechanically deforming said lower axial end such that an inner surface
10 of said blind hole circumferentially contacts an outer surface of said mechanical
11 interlock feature; and

12 (e) intermittently welding said precious metal insert to said electrode
13 about an outer peripheral interface between said insert and electrode, whereby said
14 intermittent welding results in a weld having interruptions that permit trapped gases to
15 escape from said blind hole.

1 18. A method of manufacturing an electrode assembly for an ignition device,
2 comprising the steps of:

3 mechanically interlocking a precious metal insert onto an end of a center
4 electrode;

5 welding the precious metal insert to the center electrode about a peripheral
6 surface interface between the precious metal insert and center electrode; and

7 providing a vent for trapped gases located between the precious metal insert
8 and center electrode.

1 19. The method of claim 18, wherein said welding and providing steps
2 together comprise intermittently welding said precious metal insert to said electrode
3 such that an outer peripheral weld is formed having at least one weld interruption.

1 20. The method of claim 18, wherein said providing step further comprises
2 providing a vent hole from said blind hole to an exterior surface of said electrode
3 assembly.